

## **Report: Potential for Fungal Bioremediation of Montana Pole Dioxin Contamination**

**Summary** Clifford Bradley, July 2018

### **DEQ documents**

The DEQ Final Dioxin Review concluded that: “dioxin cannot be “re-treated” and remediated any further to meet Montana Pole cleanup levels” and “containment (capping) will provide a protective solid barrier”. To support this conclusion DEQ cited 4 studies with limited relevance to Montana Pole. One study showed promise. White Rot Fungus treatment of soils with 100 times greater dioxin concentration than Montana Pole reduced dioxin contamination by 90% in 56 days; however, for comparison, final concentration was still higher than Montana Pole treatment targets. Longer treatment times might have achieved targets. The second DEQ reference tested white rot fungus at a site in Darby MT but without site-specific evaluation and using a white rot fungus strain selected for a Florida site with a chemically different contaminant, (poly aromatic hydrocarbons). Two other studies were general reviews of white rot fungus bioremediation, neither study included information for dioxins.

### **Literature review white rot fungus Dioxin Bioremediation**

Because the information DEQ based their review on was not very relevant to Montana Pole, I completed a review of scientific literature from the mid 1990s to current. My review shows potential of white rot fungus bioremediation as an alternative treatment for Montana Pole site. However, the literature search did not find reports of dioxin biodegradation at the low concentrations or large soil volumes of Montana Pole. White rot fungus bioremediation technology is site, soil and fungal strain specific and has not been reduced to universally applicable strains or methods for remediating dioxin. The most relevant studies are from Finland with 64% dioxin degradation and Japan with up to 90% dioxin degradation in contaminated soil sampled from sites.

### **Potential for White Rot Fungus Dioxin Bioremediation at Montana Pole**

With the variations in soil dioxin concentrations at Montana Pole, meeting cleanup standards would require 90% to 99% dioxin degradation. Studies show 90% to 95% dioxin degradation but in soils with higher starting concentrations than Montana Pole. Reaching 99% degradation in the Montana pole soils with the highest dioxin concentrations is unknown but could be tested in lab and field studies

The approach to dioxin remediation at Montana Pole would be to grow white rot fungus on a low cost, locally available, solid substrate such as the hybrid poplar from the Missoula sewage treatment plantation, or grain straw. Soil would be excavated, mixed with the white rot fungus culture, placed in lifts or in aerated “bio piles”, then returned to the excavation when dioxin targets are met.

The first steps would be a laboratory treatability study to select an effective fungal strain and define treatment conditions followed by a field test. These studies would cost \$120,000 to \$150,000 to determine if white rot fungus would be effective in degrading dioxin to clean up targets as alternative to leaving dioxin in place with soil capping and administrative controls. Cost of lab and field studies to test white rot fungus dioxin remediation as a permanent solution would be small compared to overall project costs.